

TABLE OF CONTENTS

Licensing

1: Fundamentals of Science and Chemistry

- 1.1: Introduction to Chemistry
- 1.2: Pseudoscience

2: Essential Background

- 2.1: Classification and Properties of Matter
- 2.2: Energy, Heat, and Temperature
- 2.3: The Measure of Matter
- 2.4: The Meaning of Measure

3: Measuring Matter

- 3.1: Units and Dimensions
- 3.2: The Meaning of Measure
- 3.3: Significant Figures and Rounding off
- 3.4: Reliability of a measurement
- 3.5: Drawing Conclusions from Data

4: The Basics of Chemistry

- 4.1: Atoms, Elements, and the Nucleus
- 4.2: Avogadro's Number and the Mole
- 4.3: Formulas and Their Meaning
- 4.4: Chemical Equations and Stoichiometry
- 4.5: Introduction to Chemical Nomenclature
- 4.6: Significant Figures and Rounding

5: Atoms and the Periodic Table

- 5.1: Primer on Quantum Theory
- 5.2: Quanta - A New View of the World
- 5.3: Light, Particles, and Waves
- 5.4: The Bohr Atom
- 5.5: The Quantum Atom
- 5.6: Atomic Electron Configurations
- 5.7: Periodic Properties of the Elements
- 5.8: Why Don't Electrons Fall into the Nucleus?

6: Properties of Gases

- 6.1: Observable Properties of Gas
- 6.2: Ideal Gas Model - The Basic Gas Laws
- 6.3: Dalton's Law
- 6.4: Kinetic Molecular Theory (Overview)
- 6.5: More on Kinetic Molecular Theory
- 6.6: Real Gases and Critical Phenomena

7: Solids and Liquids

- 7.1: Matter under the Microscope
- 7.2: Intermolecular Interactions
- 7.3: Hydrogen-Bonding and Water
- 7.4: Liquids and their Interfaces
- 7.5: Changes of State
- 7.6: Introduction to Crystals
- 7.7: Ionic and Ion-Derived Solids
- 7.8: Cubic Lattices and Close Packing
- 7.9: Polymers and Plastics
- 7.10: Colloids and their Uses
- Index

8: Solutions

- 8.1: Solutions and their Concentrations
- 8.2: Thermodynamics of Solutions
 - 8.2.2A: Solutions of Gaseous Solutes in Gaseous Solvents
 - 8.2.2B: Solutions of Gaseous Solutes in Liquid Solvents
 - 8.2.2C: Solutions of Liquid Solutes in Liquid Solvents
 - 8.2.2D: Solutions of Solid Solutes in Liquid Solvents
- 8.3: Colligative Properties- Raoult's Law
- 8.4: Colligative Properties- Boiling Point Elevation and Freezing Point Depression
- 8.5: Colligative Properties - Osmotic Pressure
- 8.6: Reverse Osmosis
- 8.7: Colligative Properties and Entropy
- 8.8: Ideal vs. Real Solutions
- 8.9: Distillation
- 8.10: Ions and Electrolytes
 - 8.10.9A: Electrolytes and Electrolytic Solutions
 - 8.10.9B: The nature of ions in aqueous solution
 - 8.10.9C: Weak and Strong Electrolytes
 - 8.10.9D: Ionic migration
 - 8.10.9E: Some applications of electrolytic conduction

9: Chemical Bonding and Molecular Structure

- 9.1: Three Views of Chemical Bonding
- 9.2: Molecules - Properties of Bonded Atoms
- 9.3: Models of Chemical Bonding
- 9.4: Polar Covalence
- 9.5: Molecular Geometry
- 9.6: The Hybrid Orbital Model
- 9.7: The Hybrid Orbital Model II
- 9.8: Molecular Orbital Theory
- 9.9: Bonding in Coordination Complexes
- 9.10: Bonding in Metals
- 9.11: Bonding in Semiconductors
- 9.12: The Shared-Electron Covalent Bond

10: Fundamentals of Acids and Bases

- 10.1: Introduction to Acids and Bases
- 10.2: Aqueous Solutions- pH and Titrations
- 10.3: Acid-base reactions à la Brønsted
- 10.4: Acid-Base Reactions
- 10.5: Lewis Acids and Bases
- 10.6: Types of Acids and Bases
- 10.7: Acid-Base Gallery

11: Chemical Equilibrium

- 11.1: Introduction to Chemical Equilibrium
- 11.2: Le Chatelier's Principle
- 11.3: Reaction Quotient
- 11.4: Equilibrium Expressions
- 11.5: Equilibrium Calculations
- 11.6: Phase Distribution Equilibria

12: Solubility Equilibria

13: Acid-Base Equilibria

- 13.1: Introduction to Acid/Base Equilibria
- 13.2: Strong Monoprotic Acids and Bases
- 13.3: Finding the pH of weak Acids, Bases, and Salts
- 13.4: Conjugate Pairs and Buffers
- 13.5: Acid/Base Titration
- 13.6: Applications of Acid-Base Equilibria
- 13.7: Exact Calculations and Approximations

14: Thermochemistry

- 14.1: Energy, Heat and Work
- 14.2: The First Law of Thermodynamics
- 14.3: Molecules as Energy Carriers and Converters
- 14.4: Thermochemistry and Calorimetry
- 14.5: Calorimetry
- 14.6: Applications of Thermochemistry
- 14.E: Thermochemistry (Exercises)

15: Thermodynamics of Chemical Equilibria

- 15.1: Energy Spreading Drives Spontaneous Change
- 15.2: Entropy Rules
- 15.3: The Second Law of Thermodynamics
- 15.4: Free Energy and the Gibbs Function
- 15.5: Thermodynamics of Mixing and Dilution
- 15.6: Free Energy and Equilibrium
- 15.7: Some Applications of Entropy and Free Energy
- 15.8: Quantum states, Microstates, and Energy spreading in Reactions

16: Electrochemistry

- 16.1: Chemistry and Electricity
- 16.2: Galvanic cells and Electrodes
- 16.3: Cell Potentials and Thermodynamics
- 16.4: The Nernst Equation
- 16.5: Applications of the Nernst Equation
- 16.6: Batteries and Fuel Cells
- 16.7: Timeline of Battery Development
- 16.8: Electrochemical Corrosion
- 16.9: Corrosion Gallery
- 16.10: Electrolytic Cells and Electrolysis

17: Chemical Kinetics and Dynamics

- 17.1: Rates of reactions and rate laws
- 17.2: Reaction Rates Typically Change with Time
- 17.3: Collision and activation- the Arrhenius law
- 17.4: Reaction Mechanisms
- 17.5: Kinetics of Reactions in Solution
- 17.6: Catalysts and Catalysis
- 17.7: Experimental methods of chemical kinetics

[Index](#)

[Glossary](#)

[Detailed Licensing](#)